

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) An image pickup system comprising:
a block extracting ~~means~~ unit for extracting a block area with a predetermined size from a signal of an image pickup device;
a transforming ~~means~~ unit for transforming the signal in the block area extracted by the block extracting ~~means~~ unit into a signal in a frequency space;
a noise ~~estimating means~~ estimator for estimating [(the)] ~~an~~ amount of ~~noises~~ noise of a frequency component except for a zero-order component based on [(the)] ~~a~~ zero-order component in the signal in the frequency space transformed by the transforming ~~means~~ unit;
a noise reducing ~~means~~ unit for reducing ~~noises~~ noise of the frequency component except for the zero-order component based on the amount of ~~noises~~ noise estimated by the noise ~~estimating means~~ estimator; and
a compressing ~~means~~ unit for compressing the zero-order component and the frequency component except for the zero-order component from which the ~~noises are~~ noise is reduced.
2. (Currently amended) An image pickup system according to Claim 1, wherein the noise ~~estimating means~~ estimator comprises:
an obtaining ~~means~~ unit for obtaining a temperature T of an image pickup

device and a gain G of the signal;

~~giving means~~ a giving unit for ~~giving~~ providing standard values of the temperature T of the image pickup device and the gain G of the signal;

~~a coefficient calculating means~~ calculator for calculating coefficients A, B, and C based on three functions $a(T, G)$, $b(T, G)$, and $c(T, G)$ using parameters serving as the temperature T ~~given~~ provided by one of the obtaining ~~means or unit and the giving means~~ giving unit and the gain G ~~given~~ provided by one of the obtaining ~~means or unit and the giving means~~ giving unit; and

~~a noise calculating means~~ calculator for calculating an amount N of ~~noises~~ noise by using a value L of the zero-order component and the coefficients A, B, and C based on $[[a]]$ ~~one of functional expression~~ expressions $[N = AL^B + C]$ ~~or and~~ $[N = AL^2 + BL + C]$.

3. (Currently amended) An image pickup system according to Claim 1, wherein the noise ~~estimating means~~ estimator comprises:

~~an~~ obtaining ~~means~~ unit for obtaining a temperature T of an image pickup device and a gain G of the signal;

~~giving means~~ a giving unit for ~~giving~~ providing standard values of the temperature T of the image pickup device and the gain G of the signal; and

~~a~~ look-up table ~~means~~ unit for obtaining an amount N of ~~noises~~ noise by inputting a value L of the zero-order component, the temperature T ~~given~~ provided by one of the obtaining ~~means or unit and the giving means~~ giving unit, and the gain G given by one of the obtaining ~~means or unit and the giving means~~ giving unit.

4. (Currently amended) An image pickup system according to Claim

1, wherein the noise reducing ~~means~~ unit comprises:

a average calculating ~~means~~ unit for calculating an average of the frequency component except for the zero-order component;

a allowable range setting ~~means~~ unit for setting an upper limit value and a lower limit value of the frequency component except for the zero-order component based on the average calculated by the average calculating ~~means~~ unit and the amount of noises noise estimated by the noise ~~estimating means~~ estimator; and

a correcting ~~means~~ unit for correcting the frequency component except for the zero-order component based on the upper limit value and the lower limit value set by the allowable range setting ~~means~~ unit.

5. (Currently amended) An image pickup system according to Claim 4, wherein the noise reducing ~~means~~ unit further comprises:

a frequency separating ~~means~~ unit for separating the frequency component except for the zero-order component ~~every of~~ predetermined frequency ~~band~~ bands; and

a selecting ~~means~~ unit for selecting whether or not ~~noises are~~ noise is reduced from the frequency band separated by the frequency separating ~~means~~ unit.

6. (Currently amended) An image pickup system according to Claim 1, wherein the noise reducing ~~means~~ unit ~~further~~ comprises:

a threshold setting ~~means~~ unit for setting an amplitude value of the noise of the frequency component except for the zero-order component as a threshold value based on the amount of noises noise estimated by the noise estimating ~~means~~ unit; and

a smoothing ~~means~~ unit for reducing an amplitude component which is below

the threshold set by the threshold setting ~~means~~ unit with respect to the frequency component except for the zero-order component.

7. (Currently amended) An image pickup system according to Claim 6, wherein the noise reducing ~~means~~ unit further comprises:

a frequency separating ~~means~~ unit for separating the frequency component except for the zero-order component ~~every of~~ predetermined frequency ~~band~~ bands; and

a selecting ~~means~~ unit for selecting whether or not the ~~noises are~~ noise is reduced from the frequency band separated by the frequency separating ~~means~~ unit.

8. (Currently amended) An image pickup system according to Claim 1, wherein the block extracting ~~means~~ unit comprises a chart separating ~~means~~ unit for separating a part corresponding to a gray chart from the signal obtained by picking-up an image for correction including at least three types ~~or more~~ of gray charts with different reflectances by the image pickup device, and

the transforming ~~means~~ unit transforms the part corresponding to the gray chart separated by the chart separating ~~means~~ unit into the signal in the frequency space, and

the image pickup system further comprises:

a variance calculating ~~means~~ unit for calculating a variance N of the frequency component except for the zero-order component of the corresponding part of the gray chart; and

a fitting ~~means~~ unit for calculating coefficients A, B, and C based ~~on a one of~~ functional ~~formula of~~ formulae $N = AL^B + C$ ~~or and~~ $N = AL^2 + BL + C$ ~~by~~ using a

value L of the zero-order component and the variance N.

9. (Currently amended) An image pickup system according to Claim 8, further comprising:

a coefficient storing ~~means~~ unit for storing the coefficients A, B, and C calculated by the fitting ~~means~~ unit.

10. (Currently amended) A replay system for processing a signal compressed after transformation to a signal in a frequency space, comprising:

a decompressing ~~means~~ unit for decompressing the signal to the signal in the frequency space;

a noise estimating ~~means~~ unit for estimating the amount of ~~noises~~ noise of a frequency component except for a zero-order component based on the zero-order component in the signal in the frequency space decompressed by the decompressing ~~means~~ unit;

a noise reducing ~~means~~ unit for reducing ~~noises~~ noise of the frequency component except for the zero-order component based on the amount of ~~noises~~ noise estimated by the noise estimating ~~means~~ unit; and

an inverting transforming ~~means~~ unit for transforming the zero-order component and the frequency component except for the zero-order component from which the ~~noises are~~ noise is reduced into a signal in a real space.

11. (Currently amended) A replay system according to Claim 10, wherein the noise estimating ~~means~~ unit comprises:

an obtaining ~~means~~ unit for obtaining a temperature T of an image pickup device and a gain G of the signal;

~~a giving-means giving unit~~ for ~~giving providing~~ standard values of the temperature T of the image pickup device and the gain G of the signal;

~~a coefficient calculating means unit~~ for calculating coefficients A, B, and C based on three functions $a(T, G)$, $b(T, G)$, and $c(T, G)$ using parameters serving as the temperature T given by one of the obtaining ~~means-or unit and~~ the ~~giving means giving unit~~ and the gain G given by one of the obtaining ~~means-or unit and~~ the ~~giving-means giving unit~~; and

~~a noise calculating means unit~~ for calculating an amount N of ~~noises noise~~ by using a value L of the zero-order component and the coefficients A, B, and C based on ~~[(a)] one of the functional expression expressions~~ $[N = AL^B + C]$ ~~or and~~ $[N = AL^2 + BL + C]$.

12. (Currently amended) A replay system according to Claim 10, wherein the noise estimating ~~means unit~~ comprises:

~~an obtaining means unit~~ for obtaining a temperature T of an image pickup device and a gain G of the signal;

~~giving-means a giving unit~~ for ~~giving providing~~ standard values of the temperature T of the image pickup device and the gain G of the signal; and

~~a look-up table means unit~~ for obtaining an amount N of ~~noises noise~~ by inputting a value L of the zero-order component, the temperature T given by one of the obtaining ~~means-or unit and~~ the ~~giving-means giving unit~~, and the gain G given by one of the obtaining ~~means-or unit and~~ the ~~giving-means giving unit~~.

13. (Currently amended) A replay system according to Claim 10, wherein the noise reducing ~~means unit~~ comprises:

~~an average calculating means unit~~ for calculating an average of the frequency

component except for the zero-order component;

a allowable range setting ~~means unit~~ for setting an upper limit value and a lower limit value of the frequency component except for the zero-order component based on the average calculated by the average calculating ~~means unit~~ and the amount of ~~noises noise~~ estimated by the noise estimating ~~means unit~~; and

a correcting ~~means unit~~ for correcting the frequency component except for the zero-order component based on the upper limit value and the lower limit value set by the allowable range setting ~~means unit~~.

14. (Currently amended) A replay system according to Claim 13, wherein the noise reducing ~~means unit~~ further comprises:

a frequency separating ~~means unit~~ for separating the frequency component except for the zero-order component ~~every of~~ predetermined frequency ~~band bands~~; and

a selecting ~~means unit~~ for selecting whether or not ~~noises are noise is~~ reduced from the frequency band separated by the frequency separating ~~means unit~~.

15. (Currently amended) A replay system according to Claim 10, wherein the noise reducing ~~means unit~~ comprises:

a threshold setting ~~means unit~~ for setting an amplitude value of the noise of the frequency component except for the zero-order component as a threshold value based on the amount of ~~noises noise~~ estimated by the noise estimating ~~means unit~~; and

a smoothing ~~means unit~~ for reducing an amplitude component which is below the threshold set by the threshold setting ~~means unit~~ with respect to the frequency component except for the zero-order component.

16. (Currently amended) A replay system according to Claim 15, wherein the noise reducing means unit further comprises:

a frequency separating means unit for separating the frequency component except for the zero-order component every of predetermined frequency band bands; and

a selecting means unit for selecting whether or not the ~~noises are~~ noise is reduced from the frequency band separated by the frequency separating means unit.

17. (Currently amended) An image pickup program ~~executed~~ stored in a machine readable medium for execution by a computer, comprising the steps of:

a) ~~a block extracting step of~~ extracting a block area with of a predetermined size from a signal ~~[[of]]~~ provided by an image pickup device;

b) ~~a transforming step of~~ transforming the signal in the block area ~~extracted by the block extracting in step (a)~~ into a signal in a frequency space;

c) ~~a noise estimating step of~~ estimating ~~[[the]]~~ an amount of ~~noises of noise in~~ a frequency component except for a zero-order component based on the zero-order component in the signal in the frequency space ~~transformed by the transforming at step (b);~~

d) ~~a noise reducing step of~~ reducing ~~noises of~~ noise in the frequency component except for the zero-order component based on the amount of ~~noises~~ noise estimated ~~by the noise estimating at step (c); and~~

e) ~~a compressing step of~~ compressing the zero-order component and the frequency component except for the zero-order component from which the ~~noises are~~ noise is reduced.

18. (Currently amended) An image pickup program according to Claim 17, wherein ~~the noise-reducing step (d) further~~ comprises:

~~f) an average-calculating step of~~ calculating an average of the frequency component except for the zero-order component;

~~g) an allowable-range-setting step of~~ setting an upper limit value and a lower limit value of the frequency component except for the zero-order component based on the average calculated ~~by the average-calculating at step (f)~~ and the amount of noises noise estimated ~~by the noise-estimating at step (c); and~~

~~h) a correcting step of~~ correcting the frequency component except for the zero-order component based on the upper limit value and the lower limit value set ~~by the allowable-range setting at step (g).~~

19. (Currently amended) An image pickup program according to Claim 17, wherein ~~the block-extracting step (a) further~~ comprises: ~~a chart-separating step of~~

~~f) separating a part corresponding to a gray chart from the signal obtained by picking-up an image for correction including at least three types or more of gray charts with different reflectances by an image pickup device, and~~

~~the transforming step (b) transforms the part corresponding to the gray chart separated by the chart-separating at step (f) into the signal in the frequency space, and~~

the image pickup program further comprises the steps of:

~~g) a variance-calculating step of~~ calculating a variance N of the frequency component except for the zero-order component of the corresponding part of the gray chart; and

~~h) a fitting step of~~ calculating coefficients A, B, and C based on one of ~~[[a]]~~ functional ~~formula~~ formulae of $N = AL^B + C$ ~~or and~~ $N = AL^2 + BL + C$ by using a value L of the zero-order component and the variance N.

20. (Currently amended) A replay program stored in a machine readable medium for execution by a computer, comprising the steps of:

~~a) a decompressing step of~~ decompressing, into a signal in a frequency space, a signal compressed after ~~[[the]]~~ transformation as ~~[[the]]~~ a signal in the frequency space;

~~b) a noise estimating step of~~ estimating ~~[[the]]~~ an amount of ~~noises of~~ noise in the frequency component except for the zero-order component based on the zero-order component of the signal in the frequency space decompressed ~~by the decompressing at step (a);~~

~~c) a noise reducing step of~~ reducing the ~~noises~~ noise of the frequency component except for the zero-order component based on the amount of ~~noises~~ noise estimated ~~by the noise estimating at step (b); and~~

~~d) an inverting transforming step of~~ transforming the zero-order component and the frequency component except for the zero-order component from which the ~~noises are~~ noise is reduced into a signal in a real space.

21. (Currently amended) A replay program according to Claim 20, wherein ~~the noise reducing step (c) further~~ comprises:

~~e) an average calculating step of~~ calculating an average of the frequency component except for the zero-order component;

~~f) an allowable range setting step of~~ setting an upper limit value and a lower limit value of the frequency component except for the zero-order component

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based on the average calculated ~~by the average calculating at~~ step (e) and the amount of noises ~~noise~~ estimated ~~by the noise estimating at~~ step (b); and

g) ~~a correcting step of~~ correcting the frequency component except for the zero-order component based on the upper limit value and the lower limit value set ~~by the allowable range setting at~~ step (f).